

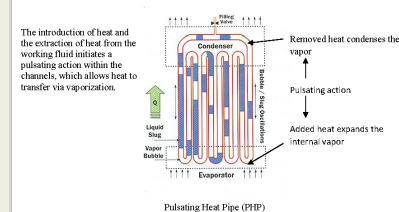
Pulsating Heat Pipes, Phase I

Completed Technology Project (2015 - 2015)



Project Introduction

An advanced heat transport technology is presented that can enable space nuclear power systems to transfer reactor heat, convert heat into electricity, reject waste heat, and provide high thermal conductivity to enhance waste heat transfer and radiator performance. This is a low cost, autonomous, high reliability and long-life solution. This technology can operate at high temperatures up to 1,000 K to either provide heat transport for reactor cooling or to dramatically increase thermal conductivity to provide the waste heat transfer for heat rejection systems. This innovative technology is based upon Peregrine's proprietary technology in pulsating heat pipes. Pulsating heat pipes are autonomous thermal transport systems that operate by pulsating action initiated by the introduction of heat and the extraction of heat to make a self-contained thermal transport device. This innovation will enable NASA missions to be more successful, more durable and of higher reliability, while also being very cost effective, lightweight and highly efficient. This innovation relies upon pulsating heat pipe technology where serpentine micro-channels are embedded within the plane of a sheet or plate of material. The micro-channels are partially charged with a working fluid. When heat is introduced to the PHP solid state device, vapor pressure locally increases (due to the serpentine pattern resistance) and vapor bubbles are created until the local increased pressure pulses from this high pressure area. At another area on this PHP device is the condenser (for thermal dissipation). In this area, heat is removed and vapor pressure is reduced, shrinking or contracting the bubbles. The pulsing from the evaporator and the contraction at the condenser, along with the system perturbations due to fluid contact angles and resistance within the serpentine channels, produces an autonomous, self-contained two-phase cooling system, in essence, the transfer of heat due to pressure changes.



Pulsating Heat Pipes, Phase I

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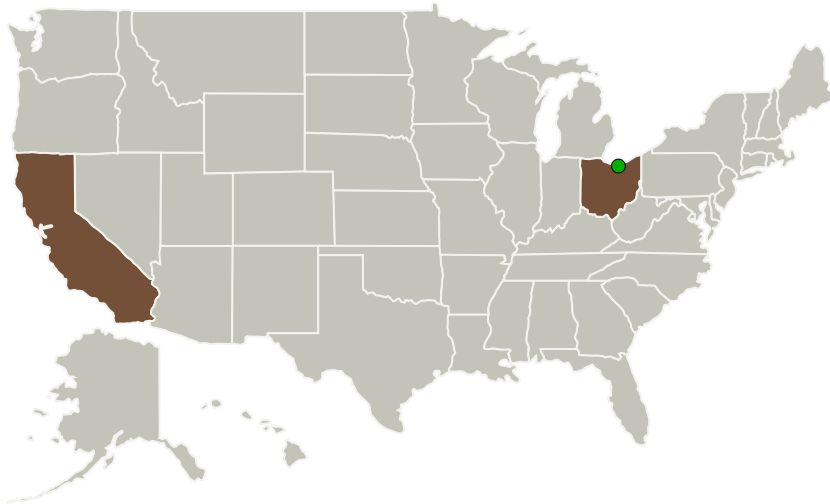
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
The Peregrine Falcon Corporation	Lead Organization	Industry	Pleasanton, California
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

California	Ohio
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Project Transitions

**June 2015:** Project Start**December 2015:** Closed out**Closeout Summary:** Pulsating Heat Pipes, Phase I Project Image**Closeout Documentation:**

- Final Summary Chart Image(<https://techport.nasa.gov/file/139243>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

The Peregrine Falcon Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

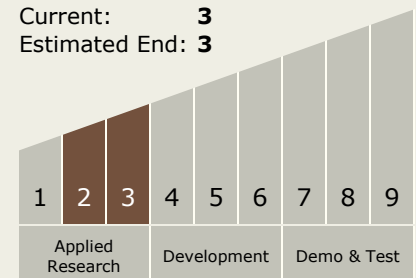
Program Manager:

Carlos Torrez

Principal Investigator:

Robert Hardesty

Technology Maturity (TRL)

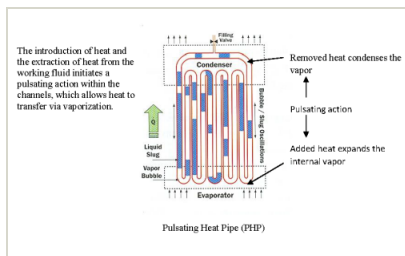
Start: **2**Current: **3**Estimated End: **3**

Pulsating Heat Pipes, Phase I

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Images



Briefing Chart Image

Pulsating Heat Pipes, Phase I

(<https://techport.nasa.gov/image/133005>)

Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.2 Thermal Control Components and Systems
 - └ TX14.2.2 Heat Transport

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System